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THE
AMERICAN
MATHEMATICAL MONTHLY.

Entered at the Post-office at Springfield, Missouri, as second-class matter.

VOL. XIX. OCTOBER-NOVEMBER, 1912. NOS. 10-11.

THE FIFTH INTERNATIONAL CONGRESS OF MATHEMATICIANS.*

From a Report by J. W. A. YOUNG, The University of Chicago.

The Fifth International Congress of Mathematicians was held at Cambridge, England, August 21 to 27, 1912. Meeting in a University which for rare beauty and charm of picturesque mediaeval buildings and exquisite gardens, can find a rival only in its sister university of Oxford; living in the rooms occupied in times past by generation after generation of the world's greatest savants, dining in halls of storied interest from whose crowded walls look down the likenesses of great men of many an age whom the world still delights to honor; royally entertained with that cordial hospitality for which the Englishman is so justly famed, the mathematicians who gathered at Cambridge from the four corners of the world lived through a unique week of their lives, and carried away with them a souvenir, never to be forgotten, of a Congress brilliant alike in historic and lovely surroundings, in elaborate social functions, and in number and value of the mathematical lectures, reports and papers presented.

The 670 members present (567 full members and 103 members of their families) were registered from twenty-seven countries, as follows:

Great Britain, 250; United States, 82; Germany, 70; France, 52; Italy, 38; Russia, 38; Spain, 25; Austria, 19; Hungary, 19; Sweden, 13; Holland, 9; Switzerland, 9; Denmark, 5; Greece, 5; Roumania, 5; Belgium, 4; Brazil, 4; Canada, 4; Norway, 4; India, 3; Japan, 3; Portugal, 3; Egypt, 2; Bulgaria, 1; Chili, 1; Mexico, 1; Servia, 1.

The sessions of the Congress were of three types: general sessions, lectures, and sectional meetings.

At the first general session Sir G. Greenhill made the following statein regard to the work of the International Commission on the Teaching of Mathematics:

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* This article includes only those portions of Professor Young's report which refer particularly to the pedagogical aspects of the work of the Congress. A more general report will be found in the *Bulletin of the American Mathematical Society*. EDITORS.

"The International Commission on the Teaching of Mathematics was appointed at the Rome Congress, on the recommendation of the members of Section IV. The several countries, in one way or another, have recognized officially the work, and have contributed financial support. About 150 reports have been published, and about 50 more will appear later. The Commission will report in certain Sessions of Section IV. The Commission hopes to be continued in power, in order that the work now in progress may be brought to completion."

At the third general session, which closed the Congress, the following resolution was unanimously passed:

Resolved, That the Congress expresses its appreciation of the support given to its Commission on the Teaching of Mathematics by various governments, institutions, and individuals; that the Central Committee composed of F. Klein (Göttingen), Sir G. Greenhill (London), and H. Fehr (Geneva), be continued in power and that, at its request, David Eugene Smith of New York be added to its number; that the delegates be requested to continue their good offices in securing the coöperation of their respective governments, and in carrying on the work; and that the Commission be requested to make such further report at the Sixth International Congress, and to hold such conferences in the meantime, as the circumstances warrant.

The sectional work was carried on in the following sections:

I. Arithmetic, Algebra, Analysis.
II. Geometry.
IIIa. Mechanics, Physical Mathematics, Astronomy.
IIIb. Economics, Actuarial Science, Statistics.
IVa. Philosophy and History.
IVb. Didactics.

The International Commission on the Teaching of Mathematics held one session separately, and three sessions jointly with Section IVb.

There were twenty-eight papers listed in Section I, twenty-two papers in Section II, eighteen papers in Section IIIa, eleven papers in Section IIIb, and twenty-one papers in Section IVa.

Section IVb held six meetings, two of them jointly with Section IVa. Three of these sessions were held jointly with the International Commission for the Teaching of Mathematics. At the first of these sessions the following address on the work of the Commission was delivered by David Eugene Smith, who had been in recent conference with the President of the Commission, Professor Klein, and the Central Committee:

"As has already been mentioned, Professor Klein, to whose great energy and wisdom the success of the International Commission on the Teaching of Mathematics is largely due, is unable to be present, on account of illness. It was my privilege to propose to the delegates at our meeting on Wednesday the sending of a telegram to Professor Klein, and I now propose the same message to Section IV, as follows: 'The International Commission on the Teaching of Mathematics, and Section IV, at their first Cambridge Meeting, express regret at your absence and best wishes for your recovery.'

"The Commission was organized for the purpose of reporting upon the present status of the teaching of mathematics in the various countries of the world. Special sub-committees have also been appointed from time to time, to consider questions of international rather than merely national interest. About one hundred and fifty reports on the work done in the various countries have been prepared, and at least fifty more are in contemplation. A world-wide interest in the improvement of mathematical teaching has been awakened, and the influence of the movement is certain to be very far reaching. Ten countries have completed the task set for themselves. In chronological order of completion these countries are Sweden, Holland, France, Switzerland, Austria, Japan, the United States of America, the British Isles, Hungary, and Denmark. In process of publication is the monumental work of Germany, with twenty-seven out of thirty-six reports already printed, and the reports of Italy, Roumania, Spain, and Russia. In contemplation are the reports of Greece, Norway, Australia, Portugal, Servia, and doubtless of several other countries.

"As to the future work of the Commission, the Central Committee earnestly desires that it be authorized to see to the completion of the reports. It is therefore very desirable that it be continued in power, both for this purpose and for the consideration of certain questions of great international significance. Such topics as the proper training of engineers, of calculus in the secondary schools, of the general value of intuition in the teaching of mathematics, of the training of teachers, and of the educational (cultural, disciplinary, non-technical) value of mathematics, may properly occupy the attention of the Commission in the next four years. Special conferences having already been held, at Bruxelles and Milano, it is proposed, if the Committee is continued in power, to hold others between now and the time of the meeting of the Congress in 1916, if that shall be the date. Possibly such conferences may be held in France in 1914, in Germany in 1915, and in Stockholm in 1916.

"It is also hoped that each country will prepare a summary of the large features of the reports of other countries, to the end that the work that has been accomplished may have its full effect. It is further hoped that the various countries will continue the financial support that has been given to the Central Committee in the past.

"A word should be said at this time in memory of those distinguished teachers who have been connected with the movement, but who have been called from their labors to solve the Great Problem. Soon after the last Congress adjourned, Professor Vailati of Rome, a distinguished writer and an accomplished scholar, passed away. Scarcely in his full prime of life, his loss is felt not by Italy alone, but by all who appreciate scholarship and high educational standards Professor Bovey, president of the Imperial Technical College at South Kensington, and who was charged with the labor of reporting for Canada, has also been called from us. In his death the world lost a scholar and an administrator of prominence. And as he was planning to attend this Congress, four weeks ago today, Geheimrath Professor P. Treutlein of Carlsruhe, passed suddenly away. In his death Germany lost one of her foremost educators, and the International Commission, one of its best supporters.

"The Central Committee has consulted with the Committee on Organization and it has been decided that the first set of reports shall be presented to the Library of the University of Cambridge, a second set to our official hosts, the Cambridge Philosophical Society, and a third set to that great world-library, the Library of the British Museum."

The General Secretary of the Commission next made a statement as to the work of the Central Committee, and submitted its collected publications.

Thereupon the reports of the various countries were formally submitted to the Congress. The countries were called in alphabetical order in the French language, and the following members of the Commission presented the reports, with a brief oral description, and a longer written statement, which will be published in the Proceedings of the Congress, and in the official organ of the Commission, *L'enseignement mathêmatique.* The statement accompanying the American report will be published in *School Science and Mathematics,* the official American organ.

Germany, Prof. A. Gutzmer (Halle); Austra, Prof. E. Czuber (Vienna); Belgium, Principal E. Clevers (Ghent); Denmark, Prof. H. Fehr; Spain, Prof. Toledo (Madrid); United States, Prof. J. W. A. Young (Chicago); France, Prof. C. Bourlet (Paris); Greece, Prof. H. Fehr; Holland, Prof. J. Cardinaal (Delft); Hungary, Prof. E. Beke (Buda-Pesth); British Isles, Prof. C. S. Jackson (Woolwich); Italy, Prof. G. Castelnuovo (Rome); Japan, Prof. R. Fujisawa (Tokio); Norway, Prof. M. Alfsen (Christiania); Portugal, Prof. F. J. Teixeira (Oporto); Roumania, Prof. G. Tzitzeica (Bucharest); Russia, Prof. H. Fehr; Sweden, Prof. H. Fehr; Switzerland, Prof. H. Fehr (Geneva).

Also the following associated countries: Brazil, Prof. E. de B. R. Gabaglia (Rio de Janeiro); Servia, Prof. M. Petrovitch (Belgrade).

At the second joint session of Section IVb and the International Commission, the report of sub-commission B, on "The mathematical education of the physicist in the university," was presented by Professor C. Runge, and followed by a lively discussion.

At the last joint session of Section IVb and the International Commission, C. Goldziher presented a report on the work done by David Eugene Smith and himself towards preparing a bibliography of works on the teaching of mathematics, published since 1900. (This bibliography is about to be published by the United States Bureau of Education and can be obtained from the Bureau on request.) Upon motion of Professor Smith the following resolution was passed:

"*Resolved,* That Section IVb of the International Congress of Mathematicians, assembled at Cambridge, expresses its thanks to the Honorable the United States Commissioner of Education for his great interest in publishing, for free distribution, the recent bibliography on the teaching of mathematics (1900-1912), and the hope that it may, through his good offices, be brought to completion to the year 1915, with such additions to the present list as may seem desirable."

David Eugene Smith then presented the Report of Sub-commission A on "Intuition and experiment in mathematical teaching in secondary schools." The presentation of the report was followed by an extended discussion. This report will be published in the various official organs named above.

In the other sessions of Section IVb, the following papers were presented:

Whitehead, A. N. "The principles of mathematics in relation to elementary teaching."

Suppandschitch, R. "Le raisonnement logique dans l'enseignement mathématique universitaire et secondaire."

Hill, M. J. M. "The teaching of the theory of proportion."

Hatzidakis, N. "Systematische Recreationsmathematik in den mittleren Schulen."

Gérardin, A. "Sur quelques nouvelles machines algébriques."

Carson, G. St. L. "The place of deduction in elementary mechanics."

Nunn, T. P. "The proper scope and method of instruction in the calculus in schools."

It was not possible to secure brief abstracts of the above papers for incorporation in this report. The papers will be published in full in the Proceedings of the Congress, and elsewhere.

This account of the Congress would be lamentably incomplete without brief mention of its social side. First of all, the four official receptions, that by Sir G. H. Darwin, President of the Cambridge Philosophical Society, in St. John's College, on Wednesday evening; that by Lord Rayleigh, Chancellor of the University, in the Fitzwilliam Museum, on Friday evening; that by the President of the Congress in Christ's College, on Sunday afternoon; and finally that by the Master and Fellows of Trinity College on Monday evening. These brilliant functions, each in a unique setting with a charm all its own, will remain in memory as pictures not to be forgotten. Sunday was fittingly closed with an organ recital in King's College Chapel, the most lustrous of all of Cambridge's architectural gems. Visits to the Observatory, and to the Cambridge Scientific works, with attendant teas, excursions to Ely, to Oxford, and to Hatfield House, were temptations that caused the devotion to his science of more than one mathematician temporarily to waver. Besides all this an able and enterprising committee of ladies had prepared for the ladies of the Congress a most attractive series of visits to the Colleges, of drives and teas in Cambridge and its environs, and of excursions to various points of interest that seemed to leave no moment without something tempting to do. Whether viewed from the social side or from the mathematical side, the Congress must be pronounced a complete success.

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THE WORD "RADIAN."

By A. R. CRATHORNE, University of Illinois.

Few terms in elementary mathematics are of such recent origin that the time and place of their first introduction into the literature can be determined. The word "radian" seems to be an exception to this statement, however, for its history goes back some forty years only. One of the originators of the word is still living.

When the "R" volume of Murray's "New English Dictionary" appeared, it gave under the definition of "radian" the date 1879, and a reference to the *Treatise on Natural Philosophy,* by Thomson and Tait, from which one inferred that here was the first use of the word. The derivation was given as "radius+an." This statement in the dictionary called forth a letter to *Nature* (Vol. 83, p. 156) from Professor Thomas Muir of Cape Town, South Africa, who claimed to have used the term in his classes at St. Andrew's University as early as 1869. At that time he was hesitating between the three words "rad," "radial" and "radian" with leanings towards the monysyllable. In 1874 after discussing the matter with the late Professor James Thompson and with Alexander Ellis, he finally adopted the term "radian," considering it as a contraction of "radial angle."

In answer to the letter of Professor Muir, Mr. James Thomson, son of Professor James Thomson, wrote a letter to *Nature* (Vol. 83, p. 217), in which he pointed out that the word had been used in 1871 by his father, before the latter knew Dr. Muir, and that on June 5, 1873, the word was printed in the examination questions at Queen's College, Belfast. These questions were published in the college calendar.

Two more letters from Mr. Thomson and Dr. Muir on the subject appear in the same volume of *Nature,* pp. 459, 460, from which it is seen that the term "radian" was used independently for some years by Professor Muir and Professor James Thomson, but that the first printed word was in the above mentioned examination papers. Professor Muir also originated the physical term "therm" in 1870 (see *Nature,* Vol. I, p. 606).